Task Sheet 9

Universität Konstanz

Behavioral attractors – ring problem

Deadline 01:00pm July 3th, 2024

Review July 10th, 2024

Lecture: *Evolutionary Robotics*, Summer Term 2024

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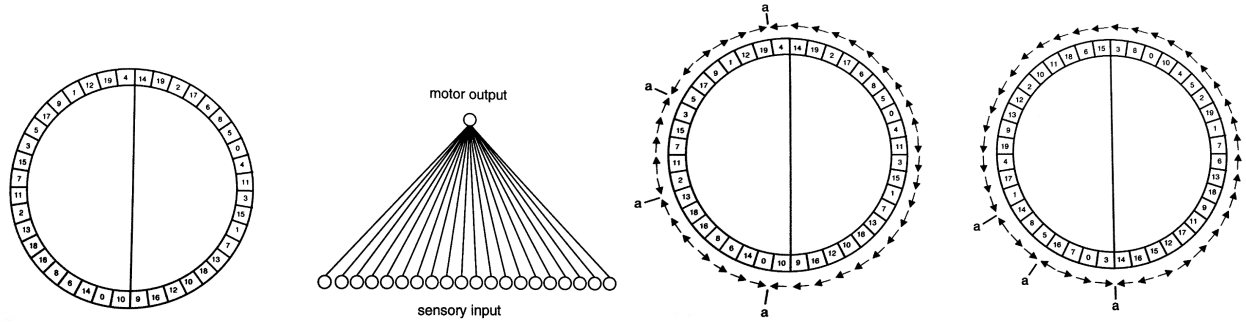
Objectives:

- implementing and solving a task based on behavioral attractors



We implement and solve the 'ring problem' (slide 24 of part 6–reactive intelligence and book p. 107). A simulated agent lives on a circular stripe which is divided into 40 cells: 20 on the left half and 20 on the right half. The cells in each half are numbered from 0 to 19 in different random order. The agent moves from cell to cell, perceives the cell's number, and moves either clockwise (CW) or counterclockwise (CCW). The agent's neural network is very simple. It has 20 input units, that encode the number of the current cell, and one output neuron (2 actions: move CW/CCW). The idea is that if the robot is at a cell with, say, number 7, then all input units are 0 except for input unit 7 which is 1. This single non-zero input is multiplied with the corresponding weight w_7, converted by an activation function of your choice, and the output is interpreted based on a threshold of your choice as motor control generating either CW motion or CCW motion. Initially the robot is placed randomly anywhere on the ring, then you should simulate enough steps to make sure that the robot has a chance to reach the left half of the ring and to stay there (i.e., appropriate choice of evaluation time). Think of an appropriate fitness function that rewards the robot for spending more time on the left half of the ring. Furthermore, you can calculate the fitness based on multiple repetitions with different initial robot positions.

Evolve a controller that solves the problem perfectly and output the motion directions that the ANN defines for each ring cell.

Your submission:

- please zip your submission in a single file named: 'evoRobo_sheet1_YOURLASTNAME1_YOURLASTNAME2.zip'
- a readme file with the full names of all group members, a list of the tasks and subtasks you have completed and/or a list of tasks/subtasks you have not completed
- accepted file formats for plots: png and jpg

- all your code
- a plot of best fitness and population-average fitness over generations for a successful evolutionary run for the deterministic approach
- an output in an appropriate form of the motion directions that your best ANN defines for each ring cell